

# CONSTRUCTION COMPONENTS FOR TUNNELS

UNDERGROUND STRUCTURES CAN ALSO BE PROTECTED BY TH PROFILES AND ALSO BY RADIALY PLACED BOLTS, WHICH STABILIZE AND STRENGTHEN THE SURROUNDING ROCK AND INCREASE THE LOAD-BEARING CAPACITY



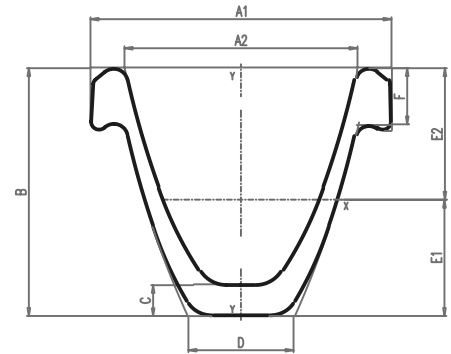
LIBERTY



## LIBERTY Ostrava TH-Profiles

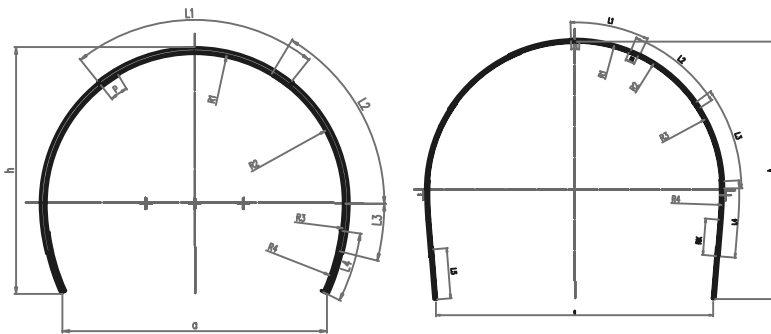
MECHANICAL PROPERTIES					
Steel grade	Standard	Re min [N/mm <sup>2</sup> ]	Rm min [N/mm <sup>2</sup> ]	A5 min [%]	Profile
31Mn4+U*	DIN 21530	350	550	18	TH16,5 TH 21 TH 29 TH 34 TH 36
31Mn4+QT**		520	650	18	

\* +U - hot rolled  
\*\* +QT - quenched and tempered

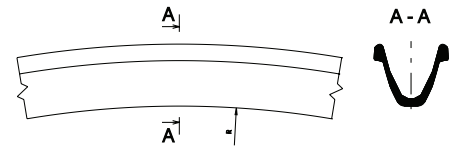


SIZES AND STATIC PROPERTIES																
Profile Type	G kg/m	S cm <sup>2</sup>	O mm	A1 mm	A2 mm	B mm	C mm	D mm	F mm	E1 mm	E2 mm	Jx cm <sup>4</sup>	Jy cm <sup>4</sup>	Wx cm <sup>3</sup>	Wy cm <sup>3</sup>	
TH 16,5	16,70	21,26	444,52	106,00	80,00	90,00	13,00	31,00	25,50	44,25	45,75	173,00	227,00	38,00	43,00	
TH 21	20,92	26,65	539,30	127,00	96,00	108,00	12,00	35,00	27,00	54,00	54,00	32,00	410,00	60,00	64,00	
TH 29	29,00	37,00	620,11	150,50	116,50	124,00	16,00	44,00	28,50	58,20	65,80	616,00	775,00	94,00	103,00	
TH 34	33,90	43,10	697,17	171,00	128,50	136,50	15,50	50,50	30,00	66,80	69,70	892,00	1205,00	128,00	141,00	
TH 36	35,90	45,70	700,08	171,00	128,50	138,00	17,00	50,50	31,50	66,80	71,20	969,00	1265,00	136,00	148,00	

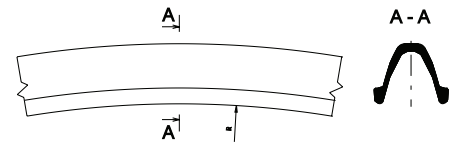
### Support types



### Normally bent support



### Inversely bent support

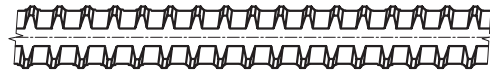


The yielding support system consists of many individual mine supports (segments). The ends of segments are overlapping and connected with particular joints.

Combining different segments leads to forming support types arches of the desired shapes.

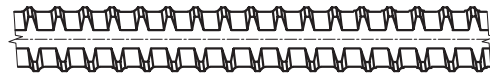
The arrangement of several arches in a row ensures the protection of the underground structures against impermissible deformations caused by the rock mass.

## LIBERTY Ostrava Rock Bolts



OTB 550/620 (LEFT-HAND THREAD)

Nominal Diameter d [mm]	Outer Diameter d <sub>a</sub> [mm]	Yield Load F <sub>e, nom</sub> [kN]	Ultimate Load F <sub>m, nom</sub> [kN]	Elongation Agt [%]	Nominal Cross section A [mm <sup>2</sup> ]	Weight [kg/m]
20	22,4	173	195	5	314	2,47
25	27,9	270	304	5	491	3,85
28	31,2	339	382	5	616	4,83
32	35,7	442	499	5	804	6,31
40	44,6	691	779	5	1257	9,87
50	55,6	1080	1217	5	1963	15,41



OTB 670/800 (RIGHT-HAND THREAD)

Nominal Diameter d [mm]	Outer Diameter d <sub>a</sub> [mm]	Yield Load F <sub>e, nom</sub> [kN]	Ultimate Load F <sub>m, nom</sub> [kN]	Elongation Agt [%]	Nominal Cross Section A [mm <sup>2</sup> ]	Weight [kg/m]
18	20,4	170	203	5	254	2,00
22	24,2	255	304	5	380	2,98
25	27,5	329	393	5	491	3,85
28	31,2	413	493	5	616	4,84
30	33,5	474	566	5	707	5,55
35	39,2	645	770	5	962	7,55
43	47,9	973	1162	5	1452	11,40
50	54,6	1315	1570	5	1963	15,41

Underground structures can also be protected by radially placed bolts, which stabilize and strengthen the surrounding rock, increasing its load-bearing capacity.

Bolts are used in the construction of the primary lining, and their selection and design must respect the geological conditions of the excavation.

The anchor bars are inserted into a pregrounded hole and fixed. The system transfers the load by bond between the bar and concrete and also between concrete and borehole.

**LIBERTY Ostrava**  
Vratimovská 689/117  
719 00 Ostrava-Kunčice  
Czech Republic

Contact our team for further details  
**Dipl. Ing. Tomáš Hamalčík**  
T: +420 595 684 700  
+420 595 685 627  
+420 595 684 590  
E: tomas.hamalcik@libertysteelgroup.com  
W: [libertysteelgroup.com/cz/](http://libertysteelgroup.com/cz/)

**Dr. Matthias Scheibe**  
T: +49 162 42 78 799  
E: [matthias.scheibe@libertysteelgroup.com](mailto:matthias.scheibe@libertysteelgroup.com)